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Subject: Effects of Prescribed Fire on Dwarf Mistletoe (mountainairrd)

To: Forest Supervisor, Cibola National Forest

This letter presents three-year post-fire results from a set of monitoring plots located in the Anderson fuelwood area on the Mountainair RD. The plots are in a dwarf mistletoe-infested ponderosa pine stand that was mechanically thinned in 1998 and 1999, and prescribe-burned in November 1999. This is the most recent of seven prescribe-burned areas we have been monitoring on the Santa Fe and Cibola NFs.

Our initial visit to the Anderson area was in response to a request from the District for assistance in predicting the survival of scorched trees (see our 3420 letter of 3/30/00). The high level of scorch and extensive dwarf mistletoe infestation in the stand provided a good opportunity to monitor fire-mistletoe interactions, as well as bark beetle activity and tree survival.

We installed two rectangular plots containing a total of 248 trees in May 2000, about six months after the fire. All trees were tagged and measured for dbh, dwarf mistletoe rating (DMR), and crown scorch. Crown scorch was estimated to the nearest 10 percent. When making these initial DMRs, crown scorch was ignored (i.e., scorched portions of the crown were assumed to be green) in order to provide a pre-burn estimate of infection.¹ All sample trees were between 6 and 14 inches dbh, with an average of about 10 inches dbh.

We have revisited the plots each fall to check tree mortality and bark beetle activity. DMRs were re-done in October 2002, approximately three years after the fire. Results are summarized in Table 1. The DMRs displayed in Table 1 are the average ratings for all live trees, including uninfected trees. Note that Plot 2, with an average crown scorch of 85%, is located in the area where this fire began to burn outside of prescription.

Table 1. Plot summary

Plot #	Size (acres)	# Trees	Average Crown Scorch	Tree Mortality (3 year)	Initial DMR (5/00)	Post-fire DMR (10/02)
1	0.8	115	63%	31%	3.10	2.33
2	1.0	133	85%	66%	1.70	1.33

¹ In the six other prescribed fires we have been monitoring, plots were installed and initial DMRs taken *prior to* the burns, which allowed somewhat better initial ratings. For a number of reasons, green trees are easier to rate for infection than recently scorched trees.



Tree mortality was much higher than we had expected based on our previous monitoring of scorched trees in other areas. Bark beetle activity, mostly *Ips* sp., was associated with much of the mortality on both plots. A few trees on both plots had signs of attack when the plots were set up in May 2000. By November of that year, many more trees had been attacked and killed by later generations. A few additional trees were attacked in 2001; both *Ips* and Western pine beetle activity were detected that year. Somewhat surprisingly, no additional attacks or tree mortality occurred in 2002, despite the severe drought. About 90% of the mortality on both plots occurred the first year after the fire.

Dwarf mistletoe infection was reduced on both plots. The actual reducing effect of the fire was probably somewhat greater than indicated in Table 1, because some *increase* in DMR most likely would have occurred between May 2000 and October 2002 without the fire. (An increase in plot/stand DMR of 0.05/year is a conservative estimate.) The reduction in infection achieved on Plot 1 should represent 10-15 years of stand growth before the DMR returns to its pre-burn level, a significant amount of control.

On Plot 1, the reduction in DMR was a result of both a higher mortality rate among heavily infected trees and scorch pruning. On Plot 2, all of the reduction in DMR was from scorch pruning; infection did not influence tree mortality in this heavily scorched area. The high level of bark beetle activity somewhat confounds the fire-mistletoe interactions on these plots; however, the reductions in DMR are similar to those we have observed in other burned areas that experienced moderate to high levels of crown scorch.

Table 2 displays tree survival by scorch class. The “expected” survival rates shown are based on results from four previous prescribed fires on the Santa Fe NF. Although mortality was higher than expected in this fire, most trees with less than 70% crown scorch survived.

Table 2. Tree survival by scorch class

Crown Scorch	#Survived/ Total#	% Survival	Expected Survival
100%	2/47	4.3	15-30%
90%	26/83	31.3	65-90%
70-80%	29/47	61.7	90-95%
0-60%	67/71	94.4	90-100%

The lower than expected survival rates among heavily scorched trees were due to several interrelated factors, especially the severe drought in 2000 and the bark beetle activity. In addition, there was more bole scorch on these plots than in most of our other plots. Most trees that died had high crown scorch, relatively high bole char, and at least some bark beetle attack.

An indirect factor influencing survival may have been the timing of the thinning before the fire. Most of this thinning was accomplished in the late summer and fall of 1998, but a few acres were not completed until the following spring. Slash from the spring thinning may well have contributed to an initial build-up of *Ips* bark beetles in the area, which were then available to attack the fire- and drought-stressed trees.

These results (in combination with other information and experience) may be useful in the development of future thinning and prescribe-burning activities. Prescribed underburning has shown promise as a tool for management of dwarf mistletoe, the most widespread and damaging disease of ponderosa pine in the Southwest. For additional information on this subject, we are enclosing report R3-01-02, *Effects of Three Prescribed Fires on Dwarf Mistletoe Infection in Southwestern Ponderosa Pine*.

Until the current drought conditions improve, extra caution is needed in prescribed burning. Heavily scorched trees under severe drought stress may have much lower survival rates than they would under more favorable conditions. Moreover, a given fire intensity can be expected to cause more severe scorch when trees have a low moisture content.

Please contact us if you have questions about this report.

/s/ Debra Allen-Reid
DEBRA ALLEN-REID
New Mexico Zone Leader,
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Enclosure

cc: Vicky Estrada, Leonard Lucero, Douglas L Parker, Terry J Rogers, John Anhold, Regis Cassidy, Edy Rhodes, Brian W Geils, Mailroom R3 Cibola